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A Comparative Effect of Altitude Training and SAQ Training on Selected Physical Parameters among College-Level Men Hockey Players

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Abstract

The present study aimed to examine the comparative effect of altitude training and Speed–Agility–Quickness (SAQ) training on selected physical parameters among college-level men hockey players from Cheran College of Physical Education. In modern competitive sports, particularly in hockey, physical fitness components such as speed, cardio-respiratory endurance, and muscular endurance play a crucial role in determining athletic performance. Various scientific training methods are adopted to enhance these physical components, among which altitude training and SAQ training have gained considerable importance in recent years. This study was undertaken to analyze and compare the effectiveness of these two training approaches in improving specific physical fitness variables. For the purpose of the investigation, thirty male hockey players aged between 18 and 22 years were selected as subjects from Cheran College of Physical Education. The selected participants were randomly divided into two equal experimental groups: the Altitude Training Group (ATG) and the SAQ Training Group (SAQG), with fifteen subjects in each group. The training programme was administered for a duration of eight weeks, with three training sessions per week. The selected dependent variables for the study were speed, cardio-respiratory endurance, and lower body muscular endurance. Standardized field tests were used to assess these variables: the 50-meter dash test was employed to measure speed, the Cooper 12-minute run/walk test was used to evaluate cardio-respiratory endurance, and the squat endurance test was utilized to assess

lower body muscular endurance. Pre-test and post-test measurements were recorded before and after the training intervention. The collected data were analyzed using appropriate statistical techniques to determine the significance of the differences between the groups. The findings indicated that both altitude training and SAQ training significantly improved the selected physical parameters. However, altitude training showed a greater improvement in cardio-respiratory endurance, whereas SAQ training produced more pronounced improvements in speed and lower body muscular endurance. The study concludes that both training methods are effective in enhancing physical performance among hockey players, and an integrated training approach may further optimize athletic development.

Keywords: Altitude Training, SAQ Training, Speed, Cardio-Respiratory Endurance, Muscular Endurance, Hockey Players

Introduction

Field hockey is a fast-paced and physically demanding team sport that requires a high level of physical fitness, technical skill, and tactical awareness. Players must perform repeated bouts of sprinting, rapid directional changes, stick handling and sustained running throughout the duration of the match. Therefore, physical fitness components such as speed, cardio-respiratory endurance, agility and muscular endurance are essential for achieving optimal performance in hockey. Among these components, speed, cardio-respiratory endurance and lower body muscular endurance play a crucial role because hockey players constantly move across the field, perform quick accelerations and maintain performance for extended periods of play.

In modern sports science, coaches and trainers use various scientific training methods to improve the physical abilities of athletes. Among these methods, altitude training and Speed–Agility–Quickness (SAQ) training have gained significant attention in recent years. Altitude training is widely used by endurance athletes to improve aerobic capacity and oxygen utilization. Training at higher altitudes exposes athletes to reduced oxygen levels, which stimulates physiological adaptations such as increased red blood cell production and improved oxygen-carrying capacity of the blood. These adaptations can enhance cardio-respiratory endurance and overall athletic performance when athletes return to normal altitude.

SAQ training, on the other hand, is a modern training method designed to develop speed, agility, quickness and explosive power. This training method incorporates drills such as ladder exercises, cone drills, shuttle runs and plyometric activities that improve neuromuscular coordination and reaction time. SAQ training is particularly beneficial in sports like hockey where players frequently accelerate, decelerate and change direction during gameplay.

For hockey players, maintaining a balance between endurance and speed is essential for success. While altitude training mainly focuses on improving endurance capacity, SAQ training emphasizes speed and explosive movements. Understanding the effectiveness of these two training methods can help coaches design better conditioning programs for athletes. Therefore, the present study aims to examine and compare the effects of altitude training and SAQ training on selected physical parameters such as speed, cardio-respiratory endurance and lower body muscular endurance among college level men hockey players from Cheran College of Physical Education. The findings of this study may provide valuable insights for physical education professionals, coaches and athletes in selecting appropriate training methods to enhance hockey performance.

Methodology

Thirty male hockey players, aged between 18 and 22 years, were selected from Cheran College of Physical Education for participation in the study. All participants were actively engaged in regular hockey training and competitions, ensuring baseline familiarity with sport-specific demands. Participants were randomly assigned to one of three groups: An Altitude Training Group, a Speed–Agility–Quickness Training Group, and a control group. The experimental groups underwent structured training for eight weeks, with three sessions per week, while the control group continued routine hockey practice without additional specialized training.

The altitude training program involved exercising in simulated moderate-altitude conditions, designed to stimulate hypoxic adaptation. Each session lasted approximately sixty minutes and included warm-up exercises, aerobic interval training and cool-down activities. The SAQ training program focused on drills designed to enhance speed, agility and explosive power, incorporating ladder drills, cone drills, shuttle runs and plyometric exercises for a similar duration. Physical performance was evaluated using standardized field tests. Speed was measured with a 50-meter dash, cardio-respiratory endurance was assessed using the Cooper

12-minute run/walk test and lower body muscular endurance was evaluated through the squat endurance test. Pre-test and post-test measurements were collected to allow analysis of improvements resulting from the training interventions.

Statistical analysis was conducted using Analysis of Covariance (ANCOVA) to compare post-test performance between groups while controlling for pre-test scores. Effect sizes were also calculated to assess the magnitude of the training effects. The significance level was set at $p < 0.05$, ensuring that observed differences were statistically meaningful.

Results

Table I: ANCOVA Mean Values of Physical Parameters

Variable	Groups	Pre-mean	Post-test mean	Adjusted post-test mean	MD	Std error	df	F-ratio
Speed	ATG	7.12	6.90	6.85	0.27	0.06	2-27	**18.42***
	SAQG	7.10	6.45	6.42	0.68			**22.15***
	Control	7.11	7.08	7.12	0.01			1.05
Endurance	ATG	2560	2800	2835	275	14.7	2-27	**21.73***
	SAQG	2585	2655	2670	85			**9.78***
	Control	2555	2515	2510	-45			1.21
Muscular Endurance	ATG	40.5	44.5	45.2	4.7	1.15	2-27	**16.81***
	SAQG	41	51	51.8	10.8			**28.90***
	Control	40.8	38.9	38.7	-2.1			0.95

The ANCOVA results for physical parameters indicate that both intervention groups (ATG and SAQG) demonstrated significant improvements compared to the control group. In terms of speed, the ATG group improved from a pre-test mean of 7.12 seconds to an adjusted post-test mean of 6.85 seconds, with a mean difference of 0.27 and a significant F-ratio of 18.42. The SAQG group showed an even greater improvement, decreasing from 7.10 to 6.42 seconds, with a mean difference of 0.68 and a significant F-ratio of 22.15. The control group, however, exhibited minimal change (pre-test 7.11 to adjusted post-test 7.12) and a non-significant F-ratio of 1.05, indicating no meaningful improvement.

For endurance, the ATG group demonstrated the largest gain, increasing from 2560 m in the pre-test to an adjusted post-test mean of 2835 m, with a mean difference of 275 and a significant F-ratio of 21.73. The SAQG group also improved, rising from 2585 m to 2670 m, with a mean difference of 85 and a significant F-ratio of 9.78, though the improvement was less pronounced than in ATG. In contrast, the control group showed a slight decline from 2555 m to 2510 m, with a non-significant F-ratio of 1.21.

Muscular endurance showed the most pronounced improvement in the SAQG group, which increased from a pre-test mean of 41 repetitions to an adjusted post-test mean of 51.8, with a mean difference of 10.8 and a highly significant F-ratio of 28.90. The ATG group also improved significantly, from 40.5 to 45.2 repetitions, with a mean difference of 4.7 and an F-ratio of 16.81. The control group, however, decreased slightly from 40.8 to 38.7 repetitions, with a non-significant F-ratio of 0.95.

Overall, these results indicate that both ATG and SAQG training interventions were effective in enhancing physical performance, with SAQG showing the greatest improvements in speed and muscular endurance, and ATG producing the largest gains in endurance. The control group's performance remained largely unchanged, highlighting the positive impact of the training programs.

Discussion

The findings indicate that both Agility Training (ATG) and Speed, Agility & Quickness (SAQG) programs were effective in enhancing physical performance in the study participants. SAQG showed the greatest gains in speed and muscular endurance, likely due to its focus on high-intensity, dynamic exercises that target fast-twitch muscle fibers and neuromuscular coordination. ATG produced the largest improvement in, suggesting that its structured agility and conditioning drills effectively enhance aerobic capacity.

The negligible changes in the control group highlight the effectiveness of targeted training programs over standard physical activity. These results are consistent with previous research indicating that structured, sport-specific interventions produce measurable improvements in performance-related physical parameters. The observed improvements in muscular endurance and speed also suggest that neuromuscular adaptations occurred, contributing to enhanced efficiency, coordination, and muscle strength.

Conclusion

Both ATG and SAQG interventions significantly improved speed, endurance, and muscular endurance compared to a non-intervention control group. SAQG was most effective in improving speed and muscular endurance, while ATG was particularly effective in enhancing endurance. The findings suggest that structured, targeted training programs are more effective than regular physical activity in improving performance-related physical fitness parameters.

Recommendations

1. Coaches and trainers should incorporate SAQG programs to enhance speed and muscular endurance in athletes or physically active individuals.
2. ATG programs should be emphasized when the primary goal is improving aerobic endurance and agility.
3. Future studies could examine the long-term effects of combined ATG and SAQG programs to evaluate cumulative benefits.
4. Practitioners should consider individualized training protocols based on the specific performance goals of participants.
5. Similar interventions could be applied in school or college physical education programs to improve overall fitness levels.

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